Report of the Incorporated Kew Committee for the Year ending December 31, 1894.

The operations of The Kew Observatory, in the Old Deer Park, Richmond, Surrey, are controlled by the Incorporated Kew Committee, which is constituted as follows :—

Mr. F. Galton, *Chairman.*

Captain W. de W. Abney, C.B., R.E.	Mr. R. H. Scott.
Prof. W. G. Adams.	Mr. W. N. Shaw.
Captain E. W. Creak, R.N.	Lieutenant-General R. Strachey, C.S.I.
Prof. G. C. Foster.	General J. T. Walker, C.B.
The Earl of Rosse, K.P.	Rear-Admiral W. J. L. Wharton.
Prof. A. W. Rücker.	

The Committee much regret the loss of the services of Admiral Sir G. H. Richards, K.C.B., formerly Hydrographer to the Admiralty, who has found it necessary to retire, after having served on the Committee from the date, 1871, when the Royal Society undertook the administration of the Observatory.

The vacancy thus occasioned has been filled by the appointment of Mr. W. N. Shaw, Tutor of Emmanuel College, Cambridge, and University Lecturer in Physics.

The work at the Observatory may be considered under the following heads:—

1st. Magnetic observations.
2nd. Meteorological observations.
3rd. Solar observations.
4th. Experimental, in connexion with any of the above departments.
5th. Verification of instruments.
6th. Rating of Watches and Marine Chronometers.
7th. Miscellaneous.

I. Magnetic Observations.

No change of importance has been made in the magnetographs during the past year. The curves representing the Declination, Hori-

zontal Force, and Vertical Force variations have been obtained uninterruptedly, and, as in former years, the scale values of all the instruments were determined in January.

The ordinates of the various photographic curves were then found to be as follows :—

Declinometer : 1 inch = 0° 22′·04. 1 cm. = 0° 8′·7.

Bifilar, January 17, 1894, for 1 inch δH = 0·0280 foot grain unit.
,, 1 cm. ,, = 0·00051 C.G.S. unit.
Balance, January 16, 1894, for 1 inch δV = 0·0287 foot grain unit.
,, 1 cm. ,, = 0·00052 C.G.S. unit.

In the case of the balance magnetometer it was found necessary to re-adjust the instrument, and as at the same time its sensibility was slightly altered, the scale value was again determined with the following result :—

Balance, January 23, 1894, for 1 inch δV = 0·0276 foot grain unit.
,, 1 cm. ,, = 0·00050 C.G.S. unit.

As regards magnetic disturbances, the most marked occurred on July 20 and August 20, though on the following dates the instruments were a good deal disturbed :—

January 3—4, February 21, 23—25, and 28, March 30—31, April 17—18, June 10, September 14—15, 19—20, and November 13.

An examination of the photographic curves of April 27 and July 10, made at the request of Mr. C. Davison, showed slight movements in the horizontal force magnet, and smaller ones in the declination magnet. These movements were associated by Mr. Davison ('B.A. Report' for 1894, p. 151, and 'Nature,' vol. 50, pp. 450—451) with the Greek and Constantinople earthquakes of the same dates. Similar examinations have since been made on one or two occasions at the instance of Mr. Davison, and of Professor Tacchini, Officio Centrale di Meteorologia, Rome, but with negative results.

The hourly means and diurnal range of the magnetic elements for 1894, for the quiet days selected by the Astronomer Royal, will be found in Appendix I.

The following are the mean results for the entire year :—

Mean Westerly Declination	17° 23′·0
Mean Horizontal Force.....	0·18251 C.G.S. unit.
Mean Inclination	67° 26′·0
Mean Vertical Force	0·43914 C.G.S. unit.

A somewhat improved method has been adopted for standardising the curves from the vertical force magnetograph. This introduces no change in the tables of "Diurnal Ranges" in the case either of

the Vertical Force or Inclination, but slightly affects the absolute values of the "Hourly Means." If the method previously in use had been followed, the mean results for the year would have been

Inclination	67° 25′·0
Vertical Force	0·43881 C.G.S. unit.

The observations of absolute declination, horizontal intensity, and inclination have been made weekly during the year.

A table of recent values of the magnetic elements at the Observatories whose publications are received at Kew was communicated to the July number of 'Science Progress,' and it is intended to contribute similar tables to the same magazine in future years. It is hoped in this way to render magnetic data more generally accessible to investigators than they have been hitherto.

Mr. Armitage, of the Jackson-Harmsworth Polar Expedition, was given a short course of instruction in the use of magnetic instruments immediately prior to the departure of the expedition in July. A unifilar magnetometer and a dip-circle were lent to the expedition on the condition of their being returned within a specified time.

Captain Lyons, R.E., practised for a few days the taking of magnetic observations previous to his departure for Egypt, and Captain Schück, of Hamburg, made a few comparisons of his instruments.

Mr. W. Watson, of the South Kensington School of Science, was, at the request of Professor Rücker, afforded facilities for making some comparisons of different magnetic instruments in the Experimental Magnetic House.

II. Meteorological Observations.

The several self-recording instruments for the continuous registration of Atmospheric Pressure, Temperature of Air and Wet-bulb, Wind (direction and velocity), Bright Sunshine, and Rain, have been maintained in regular operation throughout the year, and the standard eye observations for the control of the automatic records duly registered.

The tabulations of the meteorological traces have been regularly made, and these, as well as copies of the eye observations, with notes of weather, cloud, and sunshine, have been transmitted, as usual, to the Meteorological Office.

With the sanction of the Meteorological Council, data have been supplied to the Council of the Royal Meteorological Society, the Institute of Mining Engineers, the editor of 'Symons's Monthly Meteorological Magazine,' Dr. Rowland, and others.

Anemograph.—Early in the year a new "worm" spindle was fitted to the direction fans, and the square-headed pricker was replaced by a round one, made of extra hardened steel. At the same time the direction pencil was "trued" in the lathe to improve the marking, and later on the velocity spiral was similarly treated.

Barograph.—The analysis of the value of the residual corrections mentioned in last Report showed that a re-determination of the barograph scale was expedient. This was carried out at the Meteorological Office, and showed that the old value of 1·569 inches in the curve ordinates to 1 inch of pressure should be replaced by 1·553 inches. The new value has been employed since January 1, and the irregularities of the residuals have been much less marked from that date.

Electrograph.—This instrument has been in regular action during the year, with the exception of about eleven days in January and nineteen days in August, and its general performance has been satisfactory. Advantage was taken of the frost in January to dismount the whole of the instrument, to remove the old acid in the jar and insulators, and give the apparatus a general overhauling.

At the same time the scale was slightly opened out. The suspension thread was accidentally broken on August 16, but it was replaced, and the instrument re-started on September 4.

Determinations of the scale value were made on March 30, June 26, and December 27 by direct comparison with the Portable Electrometer, White No. 53.

The value of the scale divisions of this latter instrument was kindly determined by Professor Carey Foster at University College Laboratory during February, and the value for one division found to lie between 197—205 volts. These experiments confirmed the scale value heretofore employed, viz., 1 scale division = 200 volts.

Inspections.—In compliance with the request of the Meteorological Council, the following Observatories and Anemograph Stations were visited and inspected:—Aberdeen and Glasgow, by Mr. Chree; Stonyhurst, Armagh, Fort William, Valencia, Deerness (Orkney), Fleetwood, and Dublin, by Mr. Baker; and Oxford, Falmouth, Alnwick Castle, North Shields, and Yarmouth, by Mr. Constable.

III. Solar Observations.

Sun-spots.—Sketches of Sun-spots have been made on 156 days, and the groups numbered, after Schwabe's method.

Particulars will be found in Appendix II, Table IV.

Time Signals.—These have been regularly received from Greenwich through the G.P.O., with the exception of a few days, on which occasions supplementary signals were transmitted at later hours.

IV. Experimental Work.

Fog and Mist.—The observations of a series of distant objects, referred to in the last Report, have been continued. A note is taken of the most distant of the selected objects which is visible at each observation hour. An analysis of the results for the period May, 1892, to December, 1893, has been prepared and forwarded to the Meteorological Council.

Electrical Anemograph.—At the instance of the Meteorological Council the electrical anemograph referred to in the Report for 1890, with an improved arrangement for recording wind direction, has been under trial for some months.

Atmospheric Electricity.—To throw light on the results obtained with Lord Kelvin's water-dropper, a series of observations have recently been made for the Meteorological Office on the distribution of electric potential in the neighbourhood of the Observatory.

Aneroid Barometers.—A grant of £30 has been obtained from the Government Grant Committee for the purpose of conducting a research on the behaviour of aneroid barometers. The work of constructing the air pump and other apparatus required was entrusted to Mr. J. Hicks. He has unfortunately experienced considerable mechanical difficulties, which have delayed the construction of the apparatus. It is hoped, however, that it will be ready for use at an early date.

Thermometry.—Experiments are proceeding with a view to facilitate, and put on a more certain basis, the "time-test" in clinical thermometers—*i.e.*, the measurement of the time required by a thermometer to record the temperature of the body.

A sub-committee is now considering the question of the degree of accuracy to be aimed at in the comparison of thermometers, the form and construction of Kew Standards, and the advisability of supplying on the certificate forms fuller information than is given at present.

Lens Testing.—A large number of experiments have been made for the purpose of devising a photographic object for the definition test of lenses, which will supply more certain results than those hitherto obtained. A photographic object, reduced by Messrs. Morgan and Kidd, has given some fairly satisfactory results; but it is hoped a still further improvement may be effected by means of an object, suggested by Major Darwin, which is about to be constructed.

V. Verification of Instruments.

The subjoined is a list of the instruments examined in the year 1894, with the corresponding results for 1893:—

	Number tested in the year ending December 31.	
	1893.	1894.
Air-meters	15	4
Anemometers	24	2
Aneroids	59	48
Artificial horizons	15	31
Barometers, Marine	98	119
„ Standard	50	66
„ Station	30	12
Binoculars	466	417
Compasses	12	64
Deflectors	4	1
Hydrometers	591	289
Inclinometers	2	3
Photographic Lenses	31	27
Magnets	3	14
Navy Telescopes	913	249
Rain Gauges	19	6
Rain Measures	37	10
Sextants	517	461
Sextant Shades	47	0
Sunshine Recorders	1	1
Theodolites	2	4
Thermometers, Arctic	44	51
„ Avitreous or Immisch's	54	28
„ Chemical	57	64
„ Clinical	14,682	15,593
„ Deep sea	69	35
„ Meteorological	2,246	3,225
„ Mountain	18	23
„ Solar radiation	2	2
„ Standard	88	74
Unifilars	1	7
Vertical Force Instruments	0	6
Total	20,197	20,936

Duplicate copies of corrections have been supplied in 68 cases.

The number of instruments rejected on account of excessive error, or for other reasons, was as follows :—

Thermometers, clinical	91
„ ordinary meteorological	18
Sextants	60
Telescopes	17
Various	12

3 Standard Thermometers have been supplied during the year.

There were at the end of the year in the Observatory undergoing verification, 74 Barometers, 595 Thermometers, 9 Sextants, 3 Hydrometers, 2 Anemometers, and 3 Unifilar Magnetometers.

VI. Rating of Watches and Chronometers.

As was anticipated in last Report, the number of watches entered for the class B and C tests has been much reduced.

Those, however, entered for the higher test, class A, have been fully up to the average in number, and decidedly above the average in quality, the movements obtaining the highest grade of certificate, the class A, especially good, being considerably in excess of any previous year.

The 737 watches received were entered for trial as below :—

For class A, 378; class B, 183; class C, 166; and 10 for the subsidiary trial. Of these 7 passed the subsidiary test, 151 failed from various causes to gain any certificate; 115 were awarded class C certificates, 179 class B, and 285 class A; of the latter, 46 obtained the highest form of certificate, class A, *especially good.*

In Appendix III will be found a table giving the results of trial of the 46 watches which gained the highest number of marks during the year. The first place was taken by Messrs. Baume and Co., London, with a keyless, going-barrel, chronometer-watch, No. 103,025, with the "Tourbillon" escapement, which obtained 88·8 marks out of a maximum of 100.

The best performance of *lever* watches during the year was that of No. 52,882 by A. E. Fridlander, Coventry, which gained 87·3 marks.

The high position gained for several years past by Tourbillon watches has led to increased interest being taken by English manufacturers in this escapement, and some new forms and modifications have been devised.

Of these, one of the most successful at present appears to be that known as the "Karrusel." Specimens of this form have been sent for the A trial by different firms, and given excellent results, examples of which will be found in the list given in Appendix III.

Non-Magnetic Watches.—Fifteen watches thus designated have been examined during the year, both as to their ordinary time-keeping and also as to their "non-magnetic" properties, and although the trial to which they are submitted is severe, in the majority of cases the watches were found to perform very satisfactorily.

Marine Chronometers.—The second trial of chronometers on the Greenwich plan, mentioned in last Report, was finished in April. Of the 12 entered, 1 was withdrawn, and 8 of the remainder attained the limit prescribed by the Italian Government. A similar trial for the Portuguese Government was carried out from June to December.

A brief summary of the performance of the chronometers is given in Table III, Appendix III.

During the year 21 chronometers have been entered for the Kew A trial, of which 11 were certificated, 1 failed to pass, and 9 are still under examination.

VII. Miscellaneous.

Lens Testing.—During the year 27 lenses have been tested; of these 7 received class A and 20 class B certificates. Some of the recent forms of Jena glass lenses have been under trial. With these there appears to be a superposition of two curvatures in opposite directions, one predominating near the centre, the other at the edge of the field. The resultant curvature is generally unusually small near the centre and over the greater portion of the field, but in some instances at least it increases rapidly near the edge of the field, and special attention should be paid to the size of stop to secure the best results.

Paper.—Prepared photographic paper has been procured and supplied to the Observatories at Aberdeen, Oxford, Stonyhurst, Lisbon, Mauritius, St. Petersburg, and through the Meteorological Office to Batavia, Fort William and Valencia.

Anemograph and rain sheets and sunshine cards have been supplied to the Hong Kong and Mauritius Observatories, and blank forms for the entry of magnetic observations to the Science and Art Department, London, the India Office, the Jackson-Harmsworth Polar Expedition, and Captain Lyons, R.E.

Exhibition of Cloud Photographs.—Some specimens of cloud and other photographs and lantern slides were shown by the Committee at the Royal Meteorological Society's Exhibition in April.

Pendulum Observations.—In December Mr. E. F. J. Love, of Melbourne, at the request of Mr. Ellery, was given the use of the sextant testing room for a few days for the purpose of swinging a set of half-second pendulums on the spot where observations were taken by Major von Sterneck in April, 1893.

House, Grounds, and Path.—The negotiations with Her Majesty's Office of Woods and Forests, referred to in last year's Report, have led to an increase of 5 acres in the area of the Old Deer Park leased by the Committee. The new lease contained the condition that the entire holding should be enclosed in a substantial fence. An oak park paling has accordingly been erected at a cost of rather more than £350. This expense, however, together with that of continuing the existing roadway from Fuller's Gate, through the new holding, has been wholly met by a gift of £400 made for the purpose by Mr. F. Galton.

Library.—During the year the library has received publications from—

34 Scientific Societies and Institutions of Great Britain and Ireland.

113 Foreign and Colonial Scientific Establishments, as well as from several private individuals.

Early in the year the library received from the Royal Society of Edinburgh a present of its Proceedings and Transactions from 1882, thus completing the series from 1867. These books, as well as several others, have been bound. The Königliche Preussische Akademie der Wissenschaften, Berlin, have kindly consented to forward periodically the mathematical and physical numbers of their Sitzungsberichte. The Meteorological Office presented several copies of meteorological publications of which they had duplicates. Lady Lefroy also presented some books belonging to the late Sir J. Henry Lefroy.

Back numbers of the Kew Reports have been sent to several institutions at the request of their respective directors, and some new names have been placed on the distribution list.

The card catalogue has been proceeded with, 200 cards having been entered during the past year.

Loan Repaid.—The Kew Committee have repaid the Royal Society the final instalment of the £400 advanced by them in 1893 to defray the cost of the new building.

Audit, &c.—An audit of the Observatory accounts for 1893 was carried out in May, 1894, by Mr. Keen, Chartered Accountant, on behalf of the Royal Society. In consequence of his suggestions, some changes have been introduced in the system of book-keeping.

The accounts of 1894 have been audited by Mr. Keen on behalf of the Royal Society, and by General J. T. Walker on behalf of the Committee.

The balance sheet, with a comparison of the expenditure for the two years 1893 and 1894, is appended.

PERSONAL ESTABLISHMENT.

The staff employed is as follows:—

C. Chree, M.A., Superintendent.
T. W. Baker, Chief Assistant.
E. G. Constable, Observations and Rating.
W. Hugo, Verification Department.
J. Foster ,, ,,
T. Gunter ,, ,,
W. J. Boxall ,, ,,
E. Dagwell, Observations and Rating.
R. S. Whipple, Accounts and Library, and six other Assistants.
A Caretaker and Housekeeper are also employed.

FRANCIS GALTON,
Chairman.

March 15, 1895.

Comparison of Expenditure (excluding Commissions) for the twelve months ending December 31st, 1893, and December 31st, 1894.

Net Expenditure.	1893.	1894.	Increase.	Decrease.
Administration—	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Superintendent.....	291 13 4	400 0 0	108 6 8	..
Office.....	148 18 0	94 10 0	..	54 8 0
Rent, fuel, lighting, &c.....	85 12 3	73 19 9	..	11 12 6
Attendance and contingencies	219 3 1	210 6 8	..	8 16 5
"Whipple" Fund ..	50 0 0	..	..	50 0 0
Normal Observatory—				
Salaries.....	340 18 5	334 10 6	..	6 7 11
Incidental expenses..	63 17 5	41 2 2	..	22 15 3
Researches—				
Salaries.....	227 4 0	179 5 0	..	47 19 0
Incidental expenses..	..	0 10 0	0 10 0	..
Tests—				
Salaries.....	866 18 0	868 14 9	1 16 9	..
Incidental expenses..	181 8 7	155 2 9	..	26 5 10
Normal expenditure, showing a decrease of £117 11s. 6d.	2,475 13 1	2,358 1 7	110 13 5	228 4 11
Royal Society—				
Repayment of Loan .	200 0 0	200 0 0	..	..
Construction of New Fence round Observatory.....	..	304 3 6	304 3 6	..
Payment of Pendulum Account.....	117 1 7	..	..	117 1 7
Extension of Premises..	59 16 9	..	..	59 16 9
			414 16 11	405 3 3
			405 3 3	..
Total expenditure.....	2,852 11 5	2,862 5 1	9 13 8	..

Kew Observatory. Account of Receipts and Payments for the year ending December 31st, 1894.

Dr. **RECEIPTS.**

	£	s.	d.	£	s.	d.
To Balance from Year 1893				486	5	3
Royal Society:—	£	s.	d.			
Gassiot Trust. Annual payment	484	7	6			
,, ,, Income tax returned	89	7	8			
				573	15	2
Meteorological Council:—						
Allowance	400	0	0			
Postages, &c.	5	4	3			
				405	4	3
Researches:—						
Meteorological Council	1	5	0			
Government Grant Committee	30	0	0			
				31	5	0
Tests:—						
Verifications	1310	9	8			
Rating	622	13	7			
Lenses	10	10	5			
				1943	13	8
Commissions executed for Colonial and Foreign Institutions, &c. ...				333	0	5
Extension Fund:—						
Mr. F. Galton's donation to cover cost of constructing Fence round Observatory				400	0	0
				£4173	3	9

Cr. **PAYMENTS.**

	£	s.	d.	£	s.	d.
By Administration:—						
Superintendent	400	0	0			
Salaries	94	10	0			
Rent, Fuel, and Lighting	73	19	9			
Attendance, Cleaning, Repairs, and Insurance	210	6	8			
				778	16	5
Normal Observatory:—						
Salaries—Observations, Tabulations, &c.	334	10	6			
Incidental Expenses, Instruments, &c.	41	2	2			
				375	12	8
Researches:—						
Salaries—Observations, Reductions, &c.	179	5	0			
Incidental Expenses	0	10	0			
				179	15	0
Tests:—						
Salaries	868	14	9			
Incidental Expenses—Instruments, Postages, &c. ...	155	2	9			
				1023	17	6
Commissions for Colonial and Foreign Institutions, &c.				259	11	4
Royal Society:—						
Repayment of Loan for Extension of Premises				200	0	0
Extension Fund:—						
Payments on Account of Construction of Fence round Observatory				304	3	6
Balance:—						
Cash at the Bank of England (General Account)	829	15	2			
,, ,, (Extension Fund Account)	95	16	6			
,, London and County Bank, Richmond	112	10	0			
,, Observatory (Petty Cash)	13	5	8			
				1051	7	4
				£4173	3	9

Audited and found correct.

On behalf of the Committee. (Signed) J. T. WALKER, *General.*

On behalf of the Royal Society. (Signed) W. B. KEEN, *Chartered Accountant*

January, 1895.

ESTIMATED ASSETS.

	£	s.	d.	£	s.	d.
By Balance as per Statement (General Account)	955	10	10			
,, ,, (Extension Fund Account)	95	16	6			
				1051	7	4
Payments due:—						
Meteorological Council—Allowance, Postages, &c.	114	9	7			
Test Fees	405	8	5			
Commissions	21	19	0			
				541	17	0
Stock:—						
Blank Forms and Certificates	50	2	8			
Standard Thermometers	87	14	0			
				137	16	8
				£1731	1	0

January 18th, 1895.

ESTIMATED LIABILITIES.

	£	s.	d.
To Administration accounts—Gas, Repairs, and Contingencies	23	17	1
Observatory accounts—A.G.B. Paper, Chemicals, &c.	10	4	9
Tests accounts—Fittings, Printing, &c.	11	18	2
Commissions	17	8	9
Fencing, &c. (Extension Fund)	74	0	0
General Balance	1593	12	3
	£1731	1	0

(Signed) CHARLES CHREE,
Superintendent.

List of Instruments, Apparatus, &c., the Property of the Kew Committee, at the present date out of the custody of the Superintendent, on Loan.

To whom lent.	Articles.	Date of loan.
G. J. Symons, F.R.S.	Portable Transit Instrument	1869
The Science and Art Department, South Kensington.	Articles specified in the list in the Annual Report for 1893.....	1876
Professor W. Grylls Adams, F.R.S.	Unifilar Magnetometer, by Jones, No. 101, complete.....	1883
	Pair 9-inch Dip-Needles with Bar Magnets ...	1887
Captain W. de W. Abney, F.R.S.	Mason's Hygrometer, by Jones	1885
Lord Rayleigh, F.R.S.	Standard Barometer (Adie, No. 655)	1885
R. J. Ellery, F.R.S..	Pendulum Apparatus, complete, with Richard Thermograph.....	1892
The "Jackson-Harmsworth" Polar Expedition.	Unifilar Magnetometer, by Jones, marked N.A.B.C., complete. Dip-Circle, by Barrow, with two Needles and Bar Magnets.	
	Two Tripod Stands	1894

APPENDIX I.

Magnetical Observations, 1894.

Made at the Kew Observatory, Richmond, Lat. 51° 28′ 6″ N. and Long. $0^h\ 1^m\ 15^s{\cdot}1$ W.

The results given in the following tables are deduced from the magnetograph curves which have been standardised by observations of deflection and vibration. These were made with the Collimator Magnet K.C. I. and the Declinometer Magnet marked K.O. 90 in the 9-inch Unifilar Magnetometer by Jones.

The Inclination was observed with the Inclinometer by Barrow, No. 33, and needles 1 and 2, which are $3\frac{1}{2}$ inches in length.

The Declination and Force values given in Tables I to VIII are prepared in accordance with the suggestions made in the fifth report of the Committee of the British Association on comparing and reducing Magnetic Observations.

The following is a list of the days during the year 1894 which were selected by the Astronomer Royal, as suitable for the determination of the magnetic diurnal variations, and which have been employed in the preparation of the magnetic tables :—

January	9, 15, 19, 20, 27.
February	8, 10, 11, 14, 17.
March	5, 7, 13, 28, 29.
April	4, 11, 16, 22. 23.
May	6, 11, 12, 19, 27.
June	7, 13, 15, 26, 27.
July	7, 10, 14, 26, 31.
August	2, 10, 17, 18, 28.
September	3, 4, 6, 13, 26.
October	10, 11, 12, 23, 28.
November	4, 5, 12, 21, 22.
December	4, 11, 25, 26, 27.

Table I.—Hourly Means of Declination, as determined from the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	(17° +) West					Winter.						
1894. Months.	′	′	′	′	′	′	′	′	′	′	′	′
Jan. ..	24·8	24·7	24·9	25·0	25·0	25·0	24·8	24·6	24·2	23·6	25·0	26·4
Feb. ..	22·2	22·0	22·6	22·9	23·3	23·7	23·7	23·4	22·7	22·4	23·7	25·9
March..	23·6	23·8	23·7	23·8	23·2	23·3	22·9	22·0	20·4	20·3	22·3	25·9
Oct. ..	19·3	20·0	20·4	20·2	20·1	20·1	19·8	19·8	18·7	18·8	20·4	23·0
Nov. ..	19·1	19·7	20·0	19·8	19·9	19·6	19·1	19·3	18·7	18·6	20·2	22·1
Dec. ..	19·2	19·4	19·4	19·4	19·4	19·2	19·0	18·9	18·8	18·5	19·5	20·6
Mean	21·4	21·6	21·8	21·8	21·8	21·8	21·6	21·3	20·6	20·4	21·9	24·0
						Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′
April..	22·5	22·5	22·3	22·0	22·2	22·1	21·2	19·5	18·0	17·8	20·3	24·5
May ..	22·8	22·9	22·6	22·4	21·8	20·7	19·6	18·2	18·6	20·0	22·7	25·9
June ..	22·7	22·5	22·1	21·3	20·7	19·4	18·1	17·4	18·0	19·3	21·4	24·1
July ..	22·2	21·9	21·7	22·1	21·5	20·0	19·1	19·1	18·7	19·7	22·2	24·7
Aug. ..	22·2	21·8	21·3	21·0	20·4	19·6	18·5	17·4	17·6	19·2	23·0	26·9
Sept..	19·9	19·9	19·9	20·1	19·7	19·6	19·0	18·0	18·1	19·6	22·3	25·8
Mean	22·0	21·9	21·7	21·5	21·1	20·2	19·3	18·3	18·2	19·3	22·0	25·3

Table II.—Solar Diurnal Range of the Kew

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	−1·1	−1·2	−1·4	−1·6	−2·0	−2·9	−3·8	−4·8	−4·9	−3·8	−1·1	+2·2
						Winter Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	−1·6	−1·4	−1·2	−1·2	−1·2	−1·2	−1·4	−1·7	−2·4	−2·6	−1·1	+1·0
						Annual Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	−1·3	−1·3	−1·3	−1·4	−1·6	−2·0	−2·6	−3·3	−3·6	−3·2	−1·1	+1·6

NOTE.—When the sign is + the magnet

selected quiet Days in 1894. (The Mean for the Year = 17° 23′·0 west.)

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Winter.							
′	′	′	′	′	′	′	′	′	′	′	′	′
28·4	29·7	30·0	29·0	28·0	27·6	27·3	26·8	26·2	25·8	25·5	25·3	25·1
28·3	29·9	30·4	30·0	28·1	27·7	26·8	26·9	25·7	25·4	25·1	24·6	24·3
29·4	30·9	30·7	29·0	26·9	25·7	25·3	25·2	24·8	24·6	24·4	24·0	23·7
25·7	26·4	25·7	24·9	23·2	22·5	21·9	21·6	21·4	20·7	20·0	19·5	19·3
23·5	24·8	24·3	22·9	22·0	21·3	20·9	20·5	20·1	19·7	19·5	19·7	19·8
21·6	22·5	22·5	22·1	21·1	20·4	20·1	19·8	19·4	19·2	18·9	18·9	19·1
26·2	27·4	27·3	26·3	24·9	24·2	23·7	23·5	22·9	22·6	22·2	22·0	21·9
					Summer.							
′	′	′	′	′	′	′	′	′	′	′	′	′
28·7	31·6	31·2	29·2	27·4	25·8	24·3	23·8	23·9	23·9	24·0	23·5	23·0
29·2	30·8	31·3	29·7	27·8	26·2	25·1	24·6	23·9	23·4	23·6	23·4	23·0
27·1	28·9	28·0	27·3	26·6	25·0	24·4	23·9	23·6	23·6	23·6	22·0	22·1
27·3	28·8	29·4	28·5	26·3	24·4	23·5	23·3	23·0	22·8	22·2	21·7	20·5
29·8	30·9	29·8	28·1	25·5	23·3	22·2	22·2	22·3	22·5	21·7	22·0	21·7
28·1	29·6	28·2	25·9	24·3	22·9	22·5	22·2	21·8	21·9	21·8	21·3	20·7
28·4	30·1	29·7	28·1	26·3	24·6	23·7	23·3	23·1	23·0	22·8	22·3	21·8

Declination as derived from Table I.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+5·3	+7·0	+6·6	+5·0	+3·2	+1·5	+0·6	+0·2	0·0	−0·1	−0·3	−0·8	−1·3
					Winter Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+3·2	+4·4	+4·3	+3·3	+1·9	+1·2	+0·7	+0·5	−0·1	−0·4	−0·8	−1·0	−1·1
					Annual Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+4·3	+5·7	+5·5	+4·2	+2·6	+1·3	+0·6	+0·3	0·0	−0·2	−0·5	−0·9	−1·2

points to the west of its mean position.

Table III.—Hourly Means of the Horizontal Force in C.G.S. units (corrected
(The Mean for the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	0·18000 +					Winter.						
1894. Months.												
Jan. ..	241	240	240	240	241	244	244	244	242	235	232	229
Feb. ..	237	236	236	237	240	245	246	247	244	236	227	224
March.	249	246	246	246	246	248	249	247	240	230	221	219
Oct. ..	258	257	258	260	259	263	264	260	254	244	235	232
Nov. ..	260	261	262	261	266	271	272	268	260	251	242	240
Dec. ..	264	265	263	263	265	266	266	265	263	260	254	254
Mean	252	251	251	251	253	256	257	255	251	243	234	233
						Summer.						
April..	256	255	255	254	255	257	256	251	238	226	217	213
May ..	264	263	259	257	257	257	253	244	236	228	226	225
June ..	260	259	260	259	258	257	250	243	235	226	221	225
July ..	255	254	252	254	252	250	242	241	234	223	217	219
Aug. ..	257	258	257	256	255	252	246	235	226	220	219	223
Sept. ..	258	255	254	253	253	253	248	242	230	221	219	224
Mean	258	257	256	256	255	254	249	243	233	224	220	222

Table IV.—Diurnal Range of the Kew

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Mean.						
	+ ·00007	+ ·00006	+ ·00005	+ ·00005	+ ·00004	+ ·00003	− ·00002	− ·00008	− ·00018	− ·00027	− ·00031	− ·00029
						Winter Mean.						
	+ ·00001	·00000	·00000	·00000	+ ·00002	+ ·00005	+ ·00006	+ ·00004	·00000	− ·00008	− ·00017	− ·00018
						Annual Mean.						
	+ ·00004	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00004	+ ·00002	− ·00002	− ·00009	− ·00017	− ·00024	− ·00023

Note.—When the sign is + the

for Temperature) as determined from the selected quiet Days in 1894. Year = 0·18251.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Winter.							
229	233	235	236	239	244	247	250	248	249	248	247	245
227	233	237	243	243	247	249	252	252	251	251	250	249
225	234	240	245	249	247	250	250	251	250	250	252	250
239	246	253	255	255	261	264	264	263	265	264	264	265
240	244	251	254	259	264	267	268	266	266	266	266	267
254	258	261	262	266	269	271	270	270	266	265	266	265
236	241	246	249	252	255	258	259	258	258	257	258	257
					Summer.							
217	224	232	242	247	255	257	260	260	258	257	256	254
229	238	247	259	268	278	278	277	276	274	271	269	266
234	244	252	262	271	273	277	277	273	271	269	264	260
223	229	242	254	257	265	266	268	265	263	263	262	258
231	238	248	254	258	261	264	266	264	262	260	260	259
232	243	244	246	248	252	258	261	263	263	263	262	261
228	236	244	253	258	264	267	268	267	265	264	262	260

Horizontal Force as deduced from Table III.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Mean.							
− 00023	− ·00015	− ·00007	+ ·00002	+ ·00007	+ ·00013	+ ·00016	+ ·00017	+ ·00016	+ ·00014	+ ·00013	+ ·00011	+ ·00009
					Winter Mean.							
− ·00015	− ·00010	− ·00005	− ·00002	+ ·00001	+ ·00004	+ ·00007	+ ·00008	+ ·00007	+ ·00007	+ ·00006	+ ·00007	+ ·00006
					Annual Mean.							
− ·00019	− ·00012	− ·00006	·00000	+ ·00004	+ ·00008	+ ·00011	+ ·00012	+ ·00011	+ ·00010	+ ·00010	+ ·00009	+ ·00008

reading is above the mean.

Table V.—Hourly Means of the Kew Vertical Force in C.G.S. units (corrected
(The Mean for the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	0·43000 +					Winter.						
1894. Months.												
Jan. ..	940	939	939	938	938	938	938	937	937	936	933	932
Feb. ..	927	926	926	926	926	925	926	925	926	927	923	921
March .	938	939	939	940	941	942	944	946	944	939	931	926
Oct. ..	917	917	915	915	915	914	914	915	915	912	905	902
Nov. ..	916	915	916	916	916	916	916	916	918	917	914	913
Dec. ..	910	910	910	910	910	909	909	909	910	909	909	910
Mean	925	924	924	924	924	924	925	925	925	923	919	917
						Summer.						
April ..	945	944	944	945	944	946	946	948	947	942	936	931
May ..	910	910	912	914	916	918	919	917	913	909	901	893
June ..	900	898	897	898	899	901	904	905	901	900	893	888
July ..	888	887	887	887	889	891	890	890	884	880	875	871
Aug. ..	888	888	888	887	889	892	892	892	889	884	879	877
Sept. ..	889	890	891	892	893	893	895	897	895	891	885	880
Mean	903	903	903	904	905	907	908	908	905	901	895	890

Table VI.—Diurnal Range of the Kew

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Mean.						
	− ·00001	− ·00001	− ·00001	·00000	+ ·00001	+ ·00003	+ ·00004	+ ·00004	+ ·00001	− ·00003	− ·00009	− ·00014
						Winter Mean.						
	+ ·00001	·00000	·00000	·00000	·00000	·00000	+ ·00001	+ ·00001	+ ·00001	− ·00001	− ·00005	− ·00007
						Annual Mean.						
	·00000	·00000	·00000	·00000	+ ·00001	+ ·00002	+ ·00003	+ ·00003	+ ·00001	− ·00002	− ·00007	− ·00011

Note.—When the sign is + the

for Temperature), as determined from the selected quiet Days in 1894. Year = 0·43914.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
						Winter.						
932	933	937	940	940	938	938	938	937	937	936	935	935
920	923	927	931	932	931	929	927	927	926	925	926	926
925	931	936	942	945	944	942	941	940	939	939	939	938
901	905	908	911	914	915	914	912	913	915	915	914	914
914	916	919	920	920	919	918	917	917	918	920	919	920
910	911	913	914	915	913	912	911	912	912	912	913	912
917	920	923	926	928	927	926	924	924	925	925	924	924
						Summer.						
929	932	939	944	947	948	949	949	946	944	942	942	941
892	898	907	915	921	926	928	927	925	923	921	920	920
889	892	897	901	907	909	909	909	907	904	902	901	898
869	869	875	880	887	891	890	891	889	888	887	887	886
874	877	885	891	896	895	894	893	892	891	890	890	890
884	889	893	898	902	903	902	902	902	902	902	902	903
890	893	899	905	910	912	912	912	910	909	907	907	906

Vertical Force as deduced from Table V.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
						Summer Mean.						
−·00014	−·00011	−·00005	+·00001	+·00006	+·00008	+·00008	+·00008	+·00006	+·00005	+·00003	+·00003	+·00002
						Winter Mean.						
−·00007	−·00004	−·00001	+·00002	+·00004	+·00003	+·00002	·00000	·00000	+·00001	+·00001	·00000	·00000
						Annual Mean.						
−·00011	−·00007	−·00003	+·00002	+·00005	+·00006	+·00005	+·00004	+·00003	+·00003	+·00002	+·00001	+·00001

reading is above the mean.

Table VII.—Hourly Means of the Inclination, calculated from the Horizontal

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	67° +					Winter.						
1894. Months.	′	′	′	′	′	′	′	′	′	′	′	′
Jan....	27·3	27·3	27·3	27·3	27·2	27·1	27·1	27·0	27·2	27·6	27·7	27·9
Feb....	27·2	27·3	27·3	27·2	27·0	26·6	26·6	26·5	26·7	27·3	27·8	27·9
March.	26·7	26·9	26·9	27·0	27·0	26·9	26·9	27·1	27·5	28·0	28·4	28·4
Oct....	25·5	25·6	25·5	25·3	25·4	25·1	25·0	25·3	25·7	26·3	26·7	26·8
Nov. ..	25·4	25·3	25·2	25·3	25·0	24·6	24·6	24·8	25·4	26·0	26·5	26·6
Dec....	24·9	24·9	25·0	25·0	24·9	24·8	24·8	24·8	25·0	25·2	25·6	25·6
Mean	26·2	26·2	26·2	26·2	26·1	25·9	25·8	25·9	26·3	26·7	27·1	27·2
						Summer.						
	′	′	′	′	′	′	′	′	′	′	′	′
April..	26·4	26·5	26·5	26·6	26·5	26·4	26·5	26·9	27·7	28·4	28·8	28·9
May...	24·9	25·0	25·3	25·5	25·6	25·6	25·9	26·5	26·9	27·3	27·2	27·1
June ..	24·9	24·9	24·8	24·9	25·0	25·2	25·7	26·2	26·6	27·2	27·3	26·9
July...	24·9	25·0	25·1	25·0	25·2	25·3	25·9	25·9	26·2	26·8	27·1	26·8
Aug. ..	24·8	24·7	24·8	24·8	24·9	25·2	25·6	26·4	26·9	27·2	27·1	26·8
Sept...	24·8	25·0	25·1	25·2	25·2	25·2	25·6	26·0	26·8	27·3	27·3	26·8
Mean	25·1	25·2	25·3	25·3	25·4	25·5	25·9	26·3	26·9	27·4	27·5	27·2

Table VIII.—Diurnal Range of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Summer Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·6	−0·5	−0·4	−0·4	−0·3	−0·2	+0·2	+0·6	+1·2	+1·7	+1·8	+1·5
						Winter Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	0·0	0·0	0·0	0·0	−0·1	−0·3	−0·4	−0·3	+0·1	+0·5	+0·9	+1·0
						Annual Mean.						
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·3	−0·2	−0·2	−0·2	−0·2	−0·2	−0·1	+0·2	+0·7	+1·1	+1·4	+1·3

Note.—When the sign is +

and Vertical Forces (Tables III and IV). (The Mean for the Year = 67° 26′·0.)

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Winter.							
′	′	′	′	′	′	′	′	′	′	′	′	′
27·9	27·6	27·6	27·6	27·4	27·1	26·8	26·6	26·8	26·7	26·7	26·8	26·9
27·7	27·4	27·2	26·9	27·0	26·7	26·5	26·2	26·2	26·2	26·2	26·3	26·4
28·0	27·5	27·3	27·1	26·9	27·0	26·8	26·7	26·6	26·7	26·7	26·5	26·6
26·4	26·0	25·6	25·6	25·7	25·3	25·0	25·0	25·1	25·0	25·1	25·0	25·0
26·6	26·4	26·1	25·9	25·5	25·2	25·0	24·9	25·0	25·0	25·1	25·1	25·0
25·6	25·4	25·2	25·2	24·9	24·7	24·5	24·6	24·6	24·9	24·9	24·9	24·9
27·0	26·7	26·5	26·4	26·2	26·0	25·8	25·7	25·7	25·8	25·8	25·8	25·8
					Summer.							
′	′	′	′	′	′	′	′	′	′	′	′	′
28·6	28·2	27·9	27·4	27·1	26·6	26·5	26·3	26·2	26·3	26·3	26·4	26·5
26·8	26·3	26·0	25·4	25·0	24·4	24·5	24·5	24·6	24·6	24·8	24·9	25·1
26·4	25·8	25·4	24·8	24·4	24·3	24·0	24·0	24·2	24·3	24·4	24·7	24·9
26·5	26·1	25·4	24·8	24·8	24·3	24·2	24·1	24·3	24·4	24·4	24·4	24·7
26·1	25·8	25·3	25·1	24·9	24·7	24·5	24·3	24·4	24·5	24·6	24·6	24·7
26·4	25·8	25·8	25·8	25·8	25·5	25·1	24·9	24·8	24·8	24·8	24·8	24·9
26·8	26·3	26·0	25·6	25·3	25·0	24·8	24·7	24·8	24·8	24·9	25·0	25·1

Inclination as deduced from Table VII.

Noon	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
					Summer Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+1·1	+0·6	+0·3	−0·1	−0·4	−0·7	−0·9	−1·0	−0·9	−0·9	−0·8	−0·7	−0·6
					Winter Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+0·8	+0·5	+0·3	+0·2	0·0	−0·2	−0·4	−0·5	−0·5	−0·4	−0·4	−0·4	−0·4
					Annual Mean.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+1·0	+0·6	+0·3	0·0	−0·2	−0·5	−0·7	−0·8	−0·7	−0·7	−0·6	−0·6	−0·5

the reading is above the mean.

APPENDIX II.—Table I.

Mean Monthly Results of Temperature and Pressure for Kew Observatory. 1894.

Months.	Thermometer.								Barometer.*					Mean vapour-tension.
	Mean.	Means of—			Absolute Extremes.				Mean.	Absolute Extremes.				
		Max.	Min.	Max. and Min.	Max.	Date.	Min.	Date.		Max.	Date.	Min.	Date.	
1894.	°	°	°	°	°	d. h.	°	d. h.	ins.	ins.	d. h.	ins.	d. h.	in.
Jan.....	38·9	42·8	34·2	38·5	51·3	11 NOON.	14·0	5 10 A.M.	29·883	30·587	3 10 A.M.	29·297	31 8 A.M.	·204
Feb. ...	41·9	47·3	36·4	41·9	55·0	7 1 P.M.	23·0	21 8 „	30·063	30·568	19 0.15 „	29·282	11 11 P.M.	·221
March..	44·2	52·3	36·7	44·5	63·0	31 2 „	29·1	19 3 „	29·984	30·497	23 10 „	28·996	13 6 A.M.	·228
April...	50·6	59·3	42·6	51·0	70·2	8 3 „	33·5	22 4 „	29·878	30·289	30 MIDT.	29·370	16 1 P.M.	·274
May	50·1	57·7	42·6	50·2	66·1	16 4 „	33·8	21 4 „	29·948	30·332	1 10 P.M.	29·558	28 5 „ 29 2 A.M.	·256
June...	58·5	66·0	51·2	58·6	78·6	30 2&3 „	45·1	12 4 „	30·018	30·395	30 7 A.M.	29·681	6 8 P.M.	·364
July ...	62·1	69·9	54·8	62·4	83·4	6 4 „	48·7	14 4 „	29·898	30·320	1 0.5 „	29·284	11 2 A.M.	·418
Aug....	59·8	66·4	54·1	60·3	75·7	14 3 „	45·5	21 5 „	29·937	30·296	30 9 „	29·555	15 3 P.M.	·400
Sept....	54·2	60·5	48·4	54·5	67·6	1 3 „	36·0	28 6 „	30·137	30·507	30 11 P.M.	29·604	25 4 „	·335
Oct.....	50·1	55·1	45·2	50·2	61·7	11 2 „	32·6	17 7 „	29·924	30·518	1 9 A.M.	29·100	24 4 „	·313
Nov. ...	46·5	51·4	41·0	46·2	61·9	1 1 „	30·3	22 3 „	29·985	30·522	30 8 P.M.	28·809	12 7 „	·274
Dec. ...	42·1	46·1	37·3	41·7	51·6	14 3 A.M.	28·5	31 7 „	30·037	30·675	27 11 „	29·343	30 5 A.M.	·232
Yearly Means	49·9	56·2	43·7	50·0	..	....	..	....	29·974	..	....	..	....	·293

* Reduced to 32° at M.S.L. (The barometer cistern is 34 ft. above mean sea-level.)

This Table is compiled from "Hourly Means," vol. 1894, of the Meteorological Office.

Meteorological Observations.—Table II.

Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=overcast).	Rainfall.*			Weather. Number of days on which were registered							Wind.† Number of days on which it was								
		Total.	Maximum.	Date.	Rain. ‡	Snow.	Hail.	Thunderstorms.	Clear sky.	Overcast sky.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1894.		ins.	ins.																	
January.....	7·1	2·895	0·320	22	26	5	2	..	4	16	2	1	4	2	3	5	9	5	2	3
February....	6·3	1·565	0·470	17	15	..	..	..	6	12	2	..	1	5	1	..	9	8	4	5
March	4·9	1·215	0·375	14	9	..	2	..	12	8	2	2	3	10	1	1	9	3	2	5
April	6·2	1·460	0·605	24	15	..	2	4	4	11	1	2	4	4	4	6	7	3	..	3
May.....	6·7	1·570	0·350	10	13	..	2	3	1	11	..	7	7	2	..	3	7	3	2	..
June	7·0	2·200	0·550	3	12	..	..	1	5	17	..	4	3	2	..	1	12	4	4	..
July.....	6·8	4·370	1·435	29	17	..	..	3	3	13	..	1	2	4	..	5	10	7	2	3
August	6·8	2·525	0·625	24	17	..	..	2	3	13	..	5	2	2	..	1	10	7	4	7
September...	6·7	1·365	0·370	7	10	..	..	1	5	12	..	11	9	5	1	..	..	3	1	5
October	8·0	3·885	1·360	30	18	..	..	..	0	19	..	5	11	3	1	1	7	1	2	8
November...	6·5	2·980	0·585	14	15	..	..	1	3	10	1	2	4	..	1	10	8	2	3	5
December ...	7·2	1·990	0·880	14	16	..	..	..	3	15	1	2	2	1	1	4	11	4	6	6
Totals and means.	6·7	28·020			183	5	8	15	49	157	9	42	52	40	13	37	99	50	32	50

* Measured at 10 A.M. daily by gauge 1·75 feet above ground.

† As registered by the anemograph.

‡ The number of rainy days are those on which 0·01 inch rain or melted snow was recorded.

Meteorological Observations.—Table III.

Kew Observatory.

Months.	Bright Sunshine.				Maximum temperature in sun's rays. (Black bulb *in vacuo*.)			Minimum temperature on the ground.			Horizontal movement of the air.*		
	Total number of hours recorded.	Mean percentage of possible sunshine.	Greatest daily record.	Date.	Mean.	Highest.	Date. †	Mean.	Lowest.	Date. ‡	Average hourly velocity.	Greatest hourly velocity.	Date.
1894.	h. m.		h. m.		deg.	deg.		deg.	deg.		miles.	miles.	
January	53 24	20	7 0	26	67	86	20, 29	29	11	5, 6	13·9	42	4
February	72 48	26	8 0	12	76	103	27	31	13	22	14·0	40	11
March	161 24	44	10 0	26, 31	97	122	31	30	21	18	11·9	36	13
April	145 48	35	11 18	10	109	129	1	36	26	22	9·5	37	16
May	171 0	35	14 24	24	116	129	30	37	23	22	11·9	29	24
June	165 30	34	15 0	30	119	136	21	47	38	12	10·0	29	2
July	173 42	35	14 18	1	124	138	8	50	41	8	9·2	27	7
August	142 48	32	9 54	20	119	134	7	48	36	17, 21	9·5	31	25
September	97 30	26	10 0	11	100	120	6	43	30	29	7·8	28	9
October	50 12	15	5 48	29	85	106	26	41	25	17	9·0	32	24
November	72 42	27	6 48	18	80	105	1	35	25	29	11·0	41	14
December	44 24	18	6 6	15	64	81	23	31	23	1 & 31	11·0	40	22
Totals and Means	1351 12	29	..	..	96	..	..	38	..	..	10·7	..	..

* As indicated by a Robinson's anemograph, 70 feet above the general surface of the ground.
† Read at 10 A.M., and entered to previous day. ‡ Read at 10 A.M., and entered to same day.

Table IV.

Summary of Sun-spot Observations made at the Kew Observatory.

Months.	Days of observation.	Number of new groups enumerated.	Days apparently without spots.
1894.			
January	12	16	—
February.....	15	17	—
March.....	15	11	—
April.....	19	10	—
May.....	11	16	—
June	12	17	—
July.....	13	17	—
August	15	14	—
September.....	13	12	—
October.....	10	11	—
November.....	11	16	—
December	10	12	—
Totals for 1894	156	169	—

APPENDIX III.—Table I.

RESULTS OF WATCH TRIALS. Performance of the 46 Watches which obtained the highest number of marks during the year.

Watch deposited by	Number of watch.	Balance spring, escapement, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1° F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks. 0—100.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
Baume & Co., London	103025	Single overcoil, g.b., "tourbillon" chronometer	−1·5	−1·5	−1·4	−2·0	−1·5	0·4	0·05	3·5	32·6	39·3	16·9	88·8
Stauffer, Son, & Co., London	147625	Single overcoil, g.b., "tourbillon" chronometer	+0·4	−0·2	+0·8	+0·5	+1·2	0·4	0·04	4·0	32·8	38·5	17·1	88·4
A. E. Fridlander, Coventry	52882	Single overcoil, s.r., g.b., lever	+2·6	+2·8	+3·0	+3·0	+2·5	0·5	0·03	3·5	30·0	39·3	18·0	87·3
Stauffer, Son, & Co., London	147545	Single overcoil, g.b., "tourbillon" chronometer	+2·8	+3·3	+2·9	+1·0	+3·0	0·4	0·04	5·0	32·0	37·3	17·6	86·9
John Adams, Coventry	6162	Single overcoil, d.r., g.b., "Karrusel"	−3·0	−2·5	−2·8	+0·5	−2·9	0·3	0·04	4·7	33·4	35·8	17·5	86·7
A. E. Fridlander, Coventry	13977	Single overcoil, s.r., g.b.	+3·3	+1·2	+1·8	+1·5	+0·4	0·5	0·02	4·2	30·7	37·1	18·5	86·3
A. E. Fridlander, Coventry	14083	Single overcoil, s.r., g.b.	−1·1	+0·8	+3·4	−0·3	+2·8	0·3	0·03	6·2	33·5	33·7	18·1	85·3
A. E. Fridlander, Coventry	13758	Single overcoil, s r., g.b.	+2·2	+1·2	+1·1	+1·2	+3·1	0·4	0·05	5·5	31·2	37·2	16·7	85·1
A. H. Ratliff, Coventry	66063	Single overcoil, s.r., g.b., "Karrusel"	+2·7	+2·1	+2·3	+1·3	+0·6	0·6	0·02	4·5	28·7	37·3	18·6	84·6
A. E. Fridlander, Coventry	14084	Single overcoil, s.r., g.b.	+2·3	+3·7	+0·8	+4·5	+3·2	0·5	0·03	5·2	30·7	35·7	17·7	84·1
A. E. Fridlander, Coventry	14006	Single overcoil, s.r., g.b.	+1·5	+1·7	+2·6	+1·5	+0·8	0·4	0·10	6·0	32·4	38·3	13·4	83·9
Jos. White & Son, Coventry	35142	Single overcoil, d.r., g.b., "tourbillon" (type I)	+0·6	+0·8	+0·4	+0·8	+3·8	0·6	0·02	5·7	29·0	36·0	18·8	83·8
John Adams, Coventry	6160	Single overcoil, s.r., g.b., "Karrusel"	−1·4	−1·8	−1·3	−1·9	+2·4	0·5	0·02	6·5	30·1	34·9	18·6	83·6
Usher & Cole, London	27980	Single overcoil, s.r., g.b., "Karrusel"	+2·0	+2·4	+2·4	+5·4	+0·9	0·4	0·05	5·7	31·1	35·6	16·5	83·2
H. Golay, London	102	Single overcoil, s.r., g.b., "Karrusel"	+6·5	+5·1	+5·6	+2·3	+5·0	0·5	0·05	9·5	30·9	35·8	16·5	83·2
John Adams, Coventry	6145	Single overcoil, s.r., g b., "Karrusel"	+2·5	+2·4	+3·1	+1·1	+3·4	0·6	0·04	6·2	27·9	37·5	17·7	83·1
A. E. Fridlander, Coventry	14082	Single overcoil s.r., g.b. centre seconds	+0·6	+0·9	+1·1	+1·2	+2·5	0·6	0·06	7·2	28·7	38·1	16·2	83·0
W. Holland, Rockferry	3743	Single overcoil, s.r., g.b.	−0·5	+1·1	+0·1	−1·2	−3·0	0·5	0·04	5·7	29·2	35·6	17·6	82·4
Jos. White & Son, Coventry	34765	Single overcoil, s.r., g.b.	+1·3	−0·7	+0·6	+0·7	−0·7	0·6	0·04	7·7	28·3	37·0	17·1	82·4
A. E. Fridlander, Coventry	52884	Single overcoil, d.r., g.b.	+1·1	−0·5	−0·9	+2·7	+4·6	0·5	0·02	7·0	30·7	32·9	18·3	81·9
Usher & Cole, London	27990	Single overcoil, s.r., g.b.	+1·5	+5·3	+3·9	+3·0	+3·9	0·6	0·05	7·0	28·9	35·9	16·9	81·7
H. Golay, London	1991	Double overcoil, s.r., g.b.	+3·4	−0·5	+1·5	+2·5	+1·1	0·4	0·08	6·5	31·3	35·7	14·6	81·6

Table I—*continued.*

Watch deposited by	Number of watch.	Balance spring, escapement, &c.	Mean daily rate.					Mean variation of daily rate. ±	Mean change of rate for 1° F.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks. 0—100.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
			secs.	secs.	secs.	secs.	secs.	secs.	secs.	secs.				
Jos. White & Son, Coventry	34595	Single overcoil, s.r., g.b.	+1·6	+4·1	+4·2	+1·9	+3·8	0·5	0·06	7·7	30·0	35·6	16·0	81·6
E. F. Ashley, London	04376	Single overcoil, s.r., fusee	−1·6	+1·3	−1·5	−1·9	−5·2	0·5	0·05	8·5	30·4	34·3	16·7	81·4
Jos. White & Son, Coventry	33449	Single overcoil, d.r., g.b.	+0·7	+0·1	−0·5	+0·4	−0·5	0·6	0·08	7·0	28·4	38·3	14·7	81·4
Jos. White & Son, Coventry	34948	Single overcoil, s.r., g.b., non-magnetic ...	−0·6	−1·3	−3·5	−0·8	+0·4	0·6	0·03	7·0	27·3	36·0	18·0	81·3
H. Golay, London.....	101	Single overcoil, s.r., g b. "Karrusel"	+2·7	+2·5	+2·7	+1·6	+5·9	0·5	0·07	7·2	30·5	35·4	15·3	81·2
W. Holland, Rockferry	3756	Single overcoil, d.r., g.b. centre seconds ...	−0·9	−1·6	+3·2	+0·7	+1·2	0·6	0·01	7·7	27·6	34·3	19·3	81·2
Usher & Cole, London	27862	Single overcoil, s.r., g.b.	+1·7	+5·1	+2·6	+3·5	+0·3	0·5	0·04	6·5	29·1	34·7	17·3	81·1
A. E. Fridlander, Coventry	13716	Single overcoil, s.r., g.b.	−0·2	+0·1	+5·0	−1·6	−1·7	0·5	0·02	8·7	29·4	32·6	19·0	81·0
D. Buckney, London	11943	Double overcoil, d.r., g.b., centre seconds	−0·5	+3·5	+1·2	+3·4	+3·5	0·5	0·04	6·0	29·3	34·0	17·7	81·0
Jos. White & Son, Coventry	34152	Single overcoil, d.r., g.b.	+1·7	−0·9	+0·9	+1·7	+2·8	0·6	0·04	5·7	27·4	36·1	17·5	81·0
Jos. White & Son, Coventry	34076	Single overcoil, d.r., g.b.	+1·5	+0·7	+2·9	+1·7	+1·9	0·6	0·08	6·5	28·4	38·0	14·5	80·9
Jos. Player, Coventry	25833	Single overcoil (palladium), d.r., g.b.	−3·1	0·0	−0·5	+0·1	−1·6	0·6	0·04	8·0	27·4	35·8	17·7	80·9
W. Wordley, London	35363	Single overcoil, s.r., g.b.	−1·6	−0·1	+1·2	−2 5	−1·2	0·5	0·07	8 8	29·4	35·6	15·7	80·7
Baume & Co., London.....	3069	Single overcoil, d.r., g.b., chronograph.....	+2·9	+5·8	−2·0	+1·8	+2 5	0·6	0·01	9·7	29·0	32·6	19·0	80·6
Rotherhams, Coventry	95461	Single overcoil, s.r., g.b.	+0·1	−3·3	+3·2	+0·3	−1·0	0·5	0·06	7·7	30·8	33·5	16·1	80·5
H. Golay, London.....	4211	Double overcoil, d.r., g.b.. minute repeater	+1·2	−0·2	+2·2	+2·2	+4·0	0·6	0·06	6·0	28·8	35·6	16·1	80·5
Baume & Co., London	3157	Single overcoil, d.r.. g.b., chronograph.....	+4·1	+3·8	+1·3	+5·9	+6·1	0·5	0·06	6·7	29·9	34·4	16·1	80·4
Jos. White & Son, Coventry	34405	Single overcoil, d.r., g.b.	−1·7	+0·4	+0·9	+0·5	+1·0	0·6	0·06	6·7	27·6	36·9	15·9	80·4
H. Golay, London.....	1987	Double overcoil, s.r., g.b.....	+2·5	+2·6	+0·6	+1·7	+2·4	0·5	0·12	6·8	30·8	37·4	12·1	80·3
A. E. Fridlander, Coventry	13848	Single overcoil, s.r., g.b. centre seconds ..	+1·2	+5·7	+4·3	+2·7	+2·6	0·5	0·06	7·5	29·9	34·6	15·8	80·3
Usher & Cole, London.....	27967	Single overcoil, s.r., g.b.	+2·3	+0·9	−0·4	+4·8	+3·6	0·5	0·04	7·7	29·6	33·6	17·1	80·3
Jos. White & Co. Coventry	34964	Single overcoil, s.r., g.b.	+0·5	+1·6	0·0	+1·5	+0·7	0·7	0·04	5·0	25·5	37·8	17·0	80·3
H. Golay, London	2153	Double overcoil, d.r., g.b. chronograph	+4·4	+3·5	+4·4	+2·8	+2·0	0·6	0·07	6·0	28·4	36·7	15·1	80·2
Jos. White & Son, Coventry	34065	Single overcoil, d.r., g.b.	+0·3	+2·7	+1·3	+1·0	+1·7	0·7	0·05	4·3	26·0	37·4	16·7	80·1

In the above List, the following abbreviations are used, viz. :—s.r. for single roller; d.r. for double roller; g.b. for going barrel; + for gaining rate; − for losing rate.

Table II.

Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Received from.	Marks awarded for			Total marks, 0—100.
			Variation.	Position.	Temperature.	
Chronograph and perpetual calendar with moon's phases	5858	S. Smith and Son, London	31·8	31·4	16·3	79·5
,, ,, ,, and repeater	24968	,, ,,	24·0	34·1	18·5	76·6
Minute and split seconds chronograph	3069	Baume and Co., London	29·0	32·6	19·0	80·6
,, ,, ,,	3157	,, ,, ,,	29·9	34·4	16·1	80·4
,, ,, ,,	153612	Stauffer, Son, and Co., London	26·8	37·2	14·8	78·8
Minute and seconds chronograph	2153	H. Golay, London	28·4	36·7	15·1	80·2
,, ,, ,,	147412	Stauffer, Son, and Co., London	26·0	34·6	18·8	79·4
,, ,, ,,	2135	H. Golay, London	28·3	32·6	13·7	74·6
Minute repeater	4211	H. Golay, London	28 8	35·6	16·1	80·5
,, ,,	30820	D. Buckney, London	30·2	32·4	16·7	79·3
,, ,,	1958	H. Golay, London	27·8	35·4	15·5	78·7
"Non-magnetic" watches	34948	Jos. White and Son, Coventry	27·3	36·0	18·0	81·3
,, ,,	02122	S. Smith and Son, London	29·2	32·0	18·0	79·2
,, ,,	02124	,, ,, ,,	29·5	32·2	15·8	77·5

Table III.

Abstract of Performance of Chronometers on Trial for the Italian Government, from November, 1893, to April, 1894.

Name of maker.	Number of chronometer.	Whether 2-day or 8-day.	Description of balance, &c.	Least weekly sum.	Mean temperature for that week.	Greatest weekly sum.	Mean temperature for that week.	Difference between the greatest and least. (*a*.)	Greatest difference between one week and the next. (*b*.)	Mean temperatures for these two weeks.	Trial No. $a + 2b$.
				secs.		secs.		secs.	secs.		secs.
Johannsen, London	4363	2	Auxiliary, acting in heat....	− 4·7	55·1	+ 6·7	92·3	11·4	6·3	76·0—88·1	24·0
,, ,, ...	4385	2	,, ,, ...	− 6·5	45·4	+ 3·4	88·2	9·9	7·3	88·2—61·7	24·5
V. Kullberg, ,, ...	5435	2	,, bright spring	+ 0·2	45·4	+21·2	67·4	21·0	3·6	48·0—75·0	28·2
,, ,, ...	5385	2	,, ,, ...	− 9·7	47·1	+ 8·0	88·2	17·7	5·8	48·2—75·0	29·3
Johannsen ,, ...	4384	2	,, acting in heat....	− 8·0	75 0	+ 8·2	92·3	16·2	6·6	79·9—52·6	29·4
V. Kullberg, ,, ...	5418	2	,, bright spring	−11·5	45·4	+ 9·4	61·7	20·9	4·7	51·4—76 0	30·3
Johannsen ,, ...	4373	2	,, acting in heat....	−11·6	88·2	+ 3·1	52·2	14·7	9·9	88·2—61·7	34·5
Sewill ,, ...	4612	2	,, ...	−18·3	47·1	− 1·6	62·2	16·7	9·4	48·2—75·0	35·5

The extreme range of temperature was from 37°·8 to 103°·2 F.

Abstract of Performance of Chronometers on Trial for the Portuguese Government, from June to December, 1894.

Kullberg, London	5452	2	Auxiliary, bright spring	− 2·2	44·2	+ 9·5	94·7	11·7	4·2	86·6—49·1	20·1
,, ,, ...	5461	2	,, ,, ...	− 4·2	44·2	+ 6·5	86·6	10·7	5·0	86·6—49·1	20·7
,, ,, ...	5444	2	,, ,, ...	− 8·8	61·8	+ 6·5	86·6	15·3	2·8	75·3—80·7	20·9
,, ,, ...	5446	2	,, ,, ...	− 5·4	48·1	+ 5·7	94·7	11·1	6·1	75·0—67·7	23·3
,, ,, ...	5493	2	,, ,, ...	−15·3	44·2 / 51·4	+ 2·1	70·0	17·4	4·0	94·5—75·0	25·4

The extreme range of temperature was from 35°·6 to 102·5° F.